CHBE 405/506 001 Sp20

Learning Outcomes:

- Understand decision frameworks for chemical engineers
- Develop a working vocabulary in managerial accounting and its particular application to capital budgeting
- Understand the value of money with respect to time
- Apply the tools of capital budgeting, particularly cash flows, net present value, and internal rate of return
- Understand the principles of capital cost estimation
- Apply tools for decision-making under conditions of uncertainty
- Develop data required for project economics and life–cycle analysis
- Apply financial tools to your personal finances
- Evaluate life–cycle analyses against ISO 14040

Instructor

- Gerald (Gerry) McGlamery Jr.
- AEL (Abercrombie Engineering Laboratory) B240
- gerald.mcglamery@rice.edu

Logistics

- Schedule: Tue/Thu 0800-0915
- Room: Duncan Hall (DCH) 1075
- No class on April 2
- Office hours:
    - Tuesday and Thursday, 0945-1045
    - By appointment

Recommended Textbooks

- Towler, Gavin, and R. K. Sinnott. *Chemical Engineering Design: Principles, Practice and Economics of Plant and Process Design*. Amsterdam: Elsevier Science & Technology (2012).
    - Available online at Fondren Library

    - Chapters 7-9 are relevant
- Matthews, H. Scott. *Life Cycle Assessment: Quantitative Approaches for Decisions that Matter*. Self-published under Creative Commons License (2015).
    - Available free online at https://www.lcatextbook.com (Links to an external site.)

Required Software

- Microsoft Excel
    - Available on every campus PC
- Palisade DecisionTools 7.5.2 suite
    - We'll use the following modules:
        - TopRank
        - @RISK
        - PrecisionTree
    - Available on campus PCs in the following locations:
        - FondrenLibrary
        - Mudd 101
        - Ryon Engineering Lab 102
        - Symonds I (Sewall Hall 207)
        - Symonds II (Duncan Hall 1020)
        - Oshman Engineering Design Kitchen
    - Available on a virtual desktop (VDI)
    - You can buy a student copy directly from Palisade for 50 USD

Grade Basis

Exams	40 %
Papers	30 %
Homework	20 %
Classroom discussion	10 %

Honor Code and Ethics Policy

- All students will be held to the standards of the Rice Honor Code, a code that you pledged to honor when you matriculated at this institution. If you have forgotten the details of this code and how it is administered, you should consult the Honor System HandbookLinks to an external site..
- Within the bounds of the Rice Honor Code:
    - You may consult with each other for homework with regard to
        - Understanding requirements
        - Formulating approaches
    - You may not consult during exams
    - You may not copy each other's work for homework, papers, or exams
- The most important quality you have to offer your employer is your integrity

Exams Policy

- We will have three exams, including the final exam
    - The final exam will be comprehensive
    - Final exam: TBA
- Exam problems will be designed for solution by calculator
    - No laptops
    - No phones with calculator apps
- Work product standards are applicable
- Exams are closed book
    - You will be given all formulas
    - No other notes are allowed
    - Turn in the formula sheet(s) with the exam
- Copies will be made and kept of your exams

Homework Policy

- Homework will generally be due once each week, on a Tuesday
- If Tuesday falls on a Rice holiday, it will be due on Thursday

Regrade Policy

- Submit a request in writing to me within one week of return
- All work will be regraded, not just the work in question

Classroom Participation and Attendance Policy

We will be discussing topics where different approaches can give different answers. Classroom discussion is important to understanding the differences. Reading will be assigned to facilitate the discussion. Your preparation for and participation in the discussion is expected and part of your grade. Participation is evidenced by any of the following:

- Asking questions of the instructor in class
- Responding in class to questions asked by the instructor
- Posting or responding to questions in the course discussion forum
- Visiting the instructor during office hours

Attendance in class is expected and is part of your classroom participation grade. You will lose one point for each class that you miss on your classroom participation grade, up to the full 10 % of credit for classroom participation. You can avoid this penalty if you discuss the need for your absence with the instructor before it occurs and obtain approval to miss the class. You will still be responsible for the lecture material, classroom discussion, and homework due on that particular class day.

Work Product Standards

- Submit all homework and papers through Canvas
- All written work should be clear and easy to follow
- If I can't read it, I won't grade it
- Late work is unacceptable
- 10 % off for each day late
- Cite your data sources in all work; use a consistent format
- Use only significant figures; egregious errors will lose points
- Grammar errors will be marked; egregious errors will lose points
- If in doubt, ask — in advance

Disability Policy

If you have a documented disability or other condition that may affect your academic performance you should:

- Make sure this documentation is on file with the Disability Resource Center (Allen Center, Room 111 / adarice@rice.edu / x5841) to determine the accommodations you need
- Talk with me at the beginning of the semester to discuss your accommodation needs.

Syllabus Change Policy

This syllabus is only a guide for the course and is subject to change with advanced notice.

Course Summary:

Date	Details		
Wed Aug 28, 2019	Assignment	Read Chapter 4 in Matthews	due by 10am
	Assignment	Read ISO 14040 and 14044	due by 10am
Fri Sep 6, 2019	Assignment	LCA in Practice	due by 10am
	Assignment	Read Chapters 5 & 6 in Matthews	due by 10am
	Assignment	Read Weidema articles	due by 10am
Mon Sep 16, 2019	Assignment	Financial Ratios	due by 10am
	Assignment	Financial Statements	due by 10am
Mon Sep 23, 2019	Assignment	Cash Flow Statement Construction	due by 10am
	Assignment	Project Accounting	due by 10am
	Assignment	Taxes	due by 10am
Wed Sep 25, 2019	Assignment	Money	due by 10am
Fri Sep 27, 2019	Assignment	Capital Budgeting	due by 10am

Date	Details		
	Assignment	Financial Ratio Analysis	due by 10am
	Assignment	Project Cash Flow Statement	due by 10am
	Assignment	Read McKinsey on IRR	due by 10am
Mon Sep 30, 2019	Assignment	Exchange Rates	due by 10am
	Assignment	Interest Rates	due by 10am
	Assignment	MACRS Depreciation	due by 10am
	Assignment	Real and Nominal Prices	due by 10am
Wed Oct 2, 2019	Assignment	Spreadsheet Modeling	due by 10am
Fri Oct 4, 2019	Assignment	Amortization Table	due by 10am
	Assignment	Annuities	due by 10am
	Assignment	Bonds	due by 10am
	Assignment	Cost of Capital	due by 10am
	Assignment	Future Value	due by 10am
	Assignment	Lease vs Invest	due by 10am

Date	Details		
	Assignment	Present Value	due by 10am
	Assignment	Supply Curves	due by 10am
Wed Oct 9, 2019	Assignment	Project Execution	due by 10am
Fri Oct 11, 2019	Assignment	Competing Solutions	due by 10am
	Assignment	IRR Shortcut Graph	due by 10am
	Assignment	Levelized Cost of Electricity	due by 10am
	Assignment	Modified IRR	due by 10am
Fri Oct 18, 2019	Assignment	Cost Estimating	due by 10am
	Assignment	Ethane Cracking Capital Budget Model	due by 10am
Wed Oct 23, 2019	Assignment	LCA Memo	due by 6pm
Mon Oct 28, 2019	Assignment	Data	due by 10am
	Assignment	Equipment Costs by Exponential Scaling	due by 10am
Wed Oct 30, 2019	Assignment	Factored Equipment Cost Estimate	due by 10am

Date	Details		
	Assignment	Uncertainty and Risk	due by 10am
Mon Nov 4, 2019	Assignment	Exam 2	due by 10am
Wed Nov 6, 2019	Assignment	Read Magee	due by 10am
	Assignment	Read McKinsey on Risk Premium	due by 10am
Fri Nov 8, 2019	Assignment	Read Hertz	due by 10am
	Assignment	Read McKinsey on Making Better Decisions about Risks of Capital Projects	due by 10am
Mon Nov 11, 2019	Assignment	Cost Estimation Accuracy	due by 10am
	Assignment	Singapore Inflation Data	due by 10am
Wed Nov 13, 2019	Assignment	Forecasting	due by 10am
	Assignment	Sensitivity Analysis for Methanol Plant	due by 10am
Fri Nov 15, 2019	Assignment	Read Pratt	due by 10am
Mon Nov 18, 2019	Assignment	Methanol Plant Stochastic Model	due by 10am

Date	Details		
	Assignment	Offshore Lease Bid	due by 10am
	Assignment	Read Shell Sky Scenario	due by 10am
Fri Nov 22, 2019	Assignment	Read McKinsey on Real Options	due by 10am
	Assignment	Real Options	due by 10am
Mon Nov 25, 2019	Assignment	Steam Cracker Recommendation	due by 6pm
Wed Nov 27, 2019	Assignment	Ammonia Price Models	due by 10am
	Assignment	Cognitive Challenges	due by 10am
	Assignment	Read McKinsey on Overcoming Bias Against Risk	due by 10am
Wed Dec 4, 2019	Assignment	Final Thoughts	due by 10am
Fri Dec 6, 2019	Assignment	Utility Curves	due by 10am
Wed Dec 18, 2019	Assignment	Final Exam	due by 2pm
Tue Jan 14, 2020	Assignment	Decision Frameworks	due by 8am

Date	Details		
	Assignment	Syllabus and Philosophy	due by 8am
Thu Jan 16, 2020	Assignment	Life-cycle Assessment	due by 8am
Tue Jan 21, 2020	Assignment	Life Cycle Diagram	due by 8am
	Assignment	Classroom Discussion	
	Assignment	Exam 1	